

4.5 Max/Min Problems

p234-239

Ex 3 p237 minimum (vertex)

$$C(x) = 0.29x^2 - 1.12x + 2$$

$$C(x) = 0.29(x^2 - 4x) + 2$$

$$C(x) = 0.29(x^2 - 4x + 4 - 4) + 2$$

$$C(x) = 0.29[(x-2)^2 - 4] + 2$$

$$C(x) = 0.29(x-2)^2 - 1.12 + 2$$

$$C(x) = 0.29(x-2)^2 + 0.88$$

$$(2, 0.88)$$

The minimum cost of production is at 2000 items at a cost of \$0.88/hr.

Apr 1-9:20 AM

The demand for a new product is $p(x) = -5x + 39$, where $P(x)$ is the price of the item in thousands of dollars and x is the # of items sold in thousands. The cost function for this product is $C(x) = 4x + 30$ where $C(x)$ is the cost of the item in thousands of dollars and x is the # of items sold in thousands.

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What quantity of items must be sold for the maximum profit?
What is the maximum profit?

Profit = Revenue - Cost

Profit = $x(\text{price}) - \text{cost}$ Where x = # of items sold

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$$\begin{aligned} \text{Profit} &= x(\text{price}) - \text{cost} \\ \text{profit} &= x(-5x + 39) - (4x + 30) \\ \text{profit} &= -5x^2 + 39x - 4x - 30 \\ \text{profit} &= -5x^2 + 35x - 30 \\ &= -5(x^2 - 7x) - 30 \\ &= -5\left(x^2 - 7x + \frac{49}{4} - \frac{49}{4}\right) - 30 \\ &= -5\left(x - \frac{7}{2}\right)^2 - \frac{49}{4} - 30 \\ &= -5\left(x - \frac{7}{2}\right)^2 + \frac{245}{4} - 30 \\ &= -5\left(x - \frac{7}{2}\right)^2 + \frac{245}{4} - \frac{120}{4} \\ &= -5\left(x - \frac{7}{2}\right)^2 + \frac{125}{4} \\ &= \left(\frac{7}{2}, \frac{125}{4}\right) \quad (3.5, 31.25) \end{aligned}$$

At 3500 items sold, the company will maximize profit at \$31250

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Hmk

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q 1,2, 3,5,6, 8,9 & 11

Apr 1-9:50 AM

$$\begin{aligned} R(x) &= -x^2 + 10x + 3000 \\ &= -1(x^2 - 10x) + 3000 \\ &= -1(x^2 - 10x + 25 - 25) + 3000 \\ &= -1[(x-5)^2 - 25] + 3000 \\ &= 1(x-5)^2 + 25 + 3000 \\ &= -1(x-5)^2 + 3025 \\ &= (5, 3025) \end{aligned}$$

Increase the price by 50¢ (5x) to max revenue at \$3025

\$5.50 per package x 550 items

Mar 25-10:17 AM

3) $h(t) = -4.9t^2 + 1.5t + 1.7$

When is the diver at 5m

$$5 = -4.9t^2 + 1.5t + 1.7$$

$$0 = -4.9t^2 + 1.5t + 1.7 - 5$$

$$0 = -4.9t^2 + 1.5t - 12$$

$$0 = +4.9t^2 - 1.5t + 12$$

$a = 4.9$
 $b = -1.5$
 $c = 12$

$$\frac{-(-1.5) \pm \sqrt{(-1.5)^2 - 4(4.9)(-12)}}{2(4.9)}$$

$$\frac{+1.5 \pm \sqrt{2.25 + 235.2}}{9.8}$$

$$\frac{1.5 \pm \sqrt{237.45}}{9.8}$$

$$\frac{1.5 \pm 15.4}{9.8}$$

$$\frac{1.5 + 15.4}{9.8} \quad \frac{1.5 - 15.4}{9.8}$$

$$\frac{16.9}{9.8} \quad - \frac{13.9}{9.8}$$

$$= 1.7 \quad \text{negative value}$$

Mar 25-10:29 AM